

Prediction and measurement of weld dilution in robotic CO₂ arc welding

ABSTRACT

Weld dilution is an important feature of weld bead geometry that determines the mechanical and chemical properties of a welded joint. For robotic CO₂ arc welding, several welding process parameters are reported to be controlling the dilution. This paper investigates the relationship between four of these process parameters and dilution by depositing 'bead on plate' robotic CO₂ arc welds over mild steel plates. Two level four factor full factorial design method was used for conducting the experimental runs and linear regression models were developed accordingly. The adequacy of the models were tested by applying students 't' test and the predicted values from the models were plotted against the observed values through scatter diagram. Results showed that the proposed two level full factorial empirical models could predict the weld dilution with reasonable accuracy and ensure uniform weld quality. It can be concluded that robotic CO₂ arc welding is a very simple and effective tool for quantifying the main and interactive effects of welding parameters on dilution. Future works should focus in analyzing the influence of variable pure gasses as well as the gas mixture on dilution percentage in robotic arc welding.

Keyword: Robotic CO₂ arc welding; Process control parameters; Weld dilution; Mathematical modeling